Amendment of the Claims

Please amend claims 1, 4, 8 and 11. Please cancel claim 3.

1. (Currently Amended) A method of generating an N gray level dither matrix for an output device having sub-pixel addressability, the method comprising the steps of:

a. creating a super-resolution grid [i, j] corresponding to a pixel grid [p,q] ~~of~~;

b. generating the dither matrix for a sub-pixel grid [m,n] using the super-resolution grid [i, j] by (1) generating a dither output on the super-resolution grid [i,j]; (2) converting the dither output [i,j] to an effective response on the sub-pixel grid [m,n]; and (3) using the effective response to modulate the addition or deletion of tone of at least one sub-pixel, wherein said dither matrix is comprised of a plurality of dither patterns, each corresponding to one of the N gray levels~~, wherein each said dither pattern is derived using the super resolution grid [i,j]~~.

2. (Original) The method of claim 1 wherein the step of generating the dither matrix uses a donut filtering method.

3. (Cancelled).

4. (Currently Amended) The method of claim [[3]] 1 wherein, for each of the N gray level, steps (1), (2) and (3) are repeated, iteratively, until the such gray level is reached as a result of the modulation of tone of one or more sub-pixels.

5. (Original) The method of claim 4 wherein the output device having sub-pixel addressability has a sub-pixel resolution factor S in a first direction [p] that does not extend in an orthogonal second direction [q], whereby step (a) comprises replicating each pixel of grid [p,q] by the factor S in the first direction and the second direction to create the super-resolution grid [i,j].

6. (Original) The method of claim 4 wherein the super-resolution grid [i,j] is substantially isotropic in relation to pixel grid [p,q] by a factor S.

7. (Original) The method of claim 6 wherein the step of generating the dither matrix uses a donut filtering method.

8. (Currently Amended) The method of claim [[3]] 1 wherein step (2) further comprises averaging down in the [j] direction the dither outputs generated on super-resolution grid [i,j] to create the corresponding effective response on sub-pixel grid [m,n].

9. (Original) The method of claim 1 wherein the step of generating the dither matrix uses frequency modulation techniques.

10. (Original) A method of generating from a source N-level grayscale image a dither matrix for an output device, said output device having sub-pixel addressability of a factor S sub-pixels per pixel in a first direction [p], which sub-pixel addressability does not extend in a second orthogonal direction [q], the method comprising the steps of:

a. generating dither patterns for a subset t of N gray levels on a pixel grid [p,q];

b. converting the dither patterns generate in step (a) to a sub-pixel grid [m,n] by replication S times in the first direction [p];

c. creating a super-resolution grid [i,j] by replicating pixel grid [p,q] by sub-pixel factor S in both the first and second directions;

d. generating dither patterns of the remaining subset of (N-t) gray levels using the super-resolution grid [i,j], said generating step comprising, for each of the (N-t) gray levels, iteratively and until the gray level is reached as a result of the modulation of the tone values of one or more sub-pixels:

i. (1) generating a dither output on the super-resolution grid [i,j],

ii. (2) converting the dither output [i,j] to an effective response on the sub-pixel grid [p,q], and

iii. (3) using the effective response to modulate the addition or deletion of tone of at least one sub-pixel; and

e. combining the dither patterns of steps (b) and (d) to create the dither matrix on sub-pixel grid [m,n].

11. (Currently Amended) The method of claim [[2]] 10 wherein step (d)(ii) of converting dither outputs to corresponding effective responses further comprises the step of averaging down in the [j] direction the dither outputs generated on super-resolution grid [i,j] to create the corresponding effective response on sub-pixel grid [m,n].

12. (Original) The method of claim 10 wherein one or more of the dither patterns generated in either steps (a) or (d) is made using frequency modulation techniques.

13. (Original) The method of claim 10 wherein one or more of the dither patterns generated in either steps (a) or (d) is made using donut filters.

14. (Original) The method of claim 10 wherein the subset t of N grayscales for which dither pattern are generated at step (a) on the pixel grid [p,q] substantially correlate to a set of light tone grayscales consisting primarily of isolated pixel dots.

15. (Original) A method of generating a dither matrix of resolution [m,n] for a source image having resolution [p,q], wherein the dither matrix corresponds to the source image by a sub-pixel factor S in the [p] direction and is substantially identical to the source image in the [n] direction, such that [p,q] maps to [m,n] as [m=S*p, n=q], the method comprising the steps of:

a. creating a substantially isometric super-resolution grid [i,j] by replicating the source image in both directions S times, such that [i=S*p, j=S*q];

b. generating using the super-resolution grid a plurality of dither patterns corresponding to a plurality of desired gray levels, whereby said generating step comprises, for each desired gray level: (1) producing a dither output on the super-resolution grid [i,j], (2) averaging down the dither output [i,j] in the [j] direction by factor sub-pixel factor S to create an effective response on the sub-pixel grid [m,n] such that

[m=i, n=j/S=q], (3) and using the effective response to modulate the addition or deletion of tone of at least one sub-pixel; and

c. combining the plurality of gray level dither patterns to create the dither matrix of resolution [m,n].

16. (Original) The method of claim 15 wherein the steps of generating each dither pattern for a corresponding gray level is repeated iteratively until the gray level is reached for each dither pattern.

17. (Original) The method of claim 15 wherein the pixel grid [p,q], sub-pixel grid [m,n] and super-resolution grid [i,j] substantially correspond as [i=m=S*p, j=n*S=q*S].

18. (Original) The method of claim 15 whereby in step b) at least one dither pattern is made using a donut filter.

19. (Original) The method of claim 15 further comprises the step of combining:
a plurality dither patterns produced in accordance with steps (a) and (b), with
one or more dither patterns produced on the pixel grid [p,q] using conventional dithering methods whereby said dither patterns are replicated in the [p] direction to create corresponding sub-pixel patterns on the [m,n] grid.